

NOTES ON (I) PLEISTOCENE, (II) HOLOCENE, (III) RECENT NON-MARINE SHELLS FROM MALLORCA; (IV) MARINE SHELLS ASSOCIATED WITH THE HOLOCENE DEPOSITS; (V) MARINE SHELLS FROM ALCUDIA, MALLORCA; (VI) NON-MARINE SHELLS FROM MANRESA, CATALUÑA.

By Rev. R. ASHINGTON BULLEN, B.A., F.I.S., F.G.S.

Read 11th March, 1910.

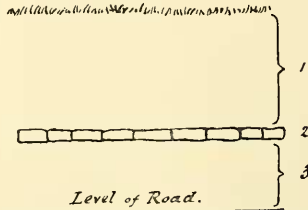
THE list of shells from Mallorca need a few words of explanation, otherwise they are principally useful as localizing certain species, a sort of pioneer work which may some day prove advantageous.

I. PLEISTOCENE.

The Pleistocene forms are interesting principally as having been found by Miss Dorothea M. A. Bate in the same deposits in which she discovered *Myotragus Balearicus*, Bate, last spring, as described in the Geological Magazine, 1909, p. 385. The Quaternary rocks of Majorca and Minorca are discussed by Henri Hermite.<sup>1</sup> It is not necessary to go into the geological questions involved, otherwise than saying that he mentions the occurrence of *Helix Companyoni*, Aléron, in deposits containing many (still existing) marine species near Palma; also near Andraitx *H. Companyoni* and *Tudorella ferruginea*, Lam., and near Coll d'en Rebasa the two latter with *Bulimus* sp. and *Helix Caroli*, Dohrn (var.). However, it behoves one to say that as these Quaternary rocks are not differentiated sufficiently from one another, it is uncertain whether these deposits, containing the above-mentioned land shells, are to be regarded as Pleistocene or Holocene; if the level at which they occur were known we might be more certain of the epoch to which they severally belong. The four species found by Miss Bate are definitely Pleistocene, having been found in company with a now extinct mammal.

II. HOLOCENE.

*Porto Pi.*—The shells found here occurred in a hill-wash down to a depth of 8 feet. The section was well-defined, near the end



of the mule tram-car line from Palma, about 3 miles out from the latter place. The face nearest the road contained (besides the non-marine mollusca) specimens of marine mollusca and some fragments of

<sup>1</sup> "Études géologiques sur les îles Baléares" (Première Partie), Paris, 1879, pp. 277-99.

pottery, the thick blackish pottery with yellow glaze being found about 5 feet down. I noticed no pottery of this type of colour in the market at Palma. The other fragments were nearer the surface. The pottery and marine shells probably are derived from refuse material and seaweed, used to fertilize the soil, for the island has been agriculturally occupied certainly from Phœnician times and probably much earlier. The depth of the deposit gradually thins off up the hill above. The section observed is a considerable distance in from the sea-front, and about 60 feet above sea-level.

1. Overburden (containing non-marine and marine mollusca and pottery) varying from 6-8 feet in thickness.
2. Sandy limestones 10-15 inches in thickness.
3. Red crumbly clay.

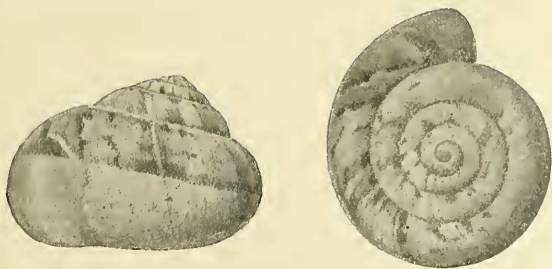
*Alcudia*.<sup>1</sup>—The Holocene deposits at Alcudia form a low sea-cliff quite near the sea, there being very little foreshore—in some parts none. The farmers use seaweed for manure, and this probably accounts for the mixture of non-marine and marine shells in the course of ages. The land has a slight slope downwards to the sea-front, and the soil has no doubt been washed down in that direction, and caused the mélange.

*Manresa*.—These Holocene deposits were near the bridge above the railway, and were in places quite 10 feet thick.

### III. THE RECENT NON-MARINE MOLLUSCA.

*Bellver*.—The hill on which Bellver Castle stands is about 350 feet O.D., and is very rich in mollusca. The Holocene deposit was near the summit of the hill.

*Alcudia* (Port of).—The recent land and freshwater mollusca were found on the large stretch of blown sand, with swampy bits of land in parts of it, which is dammed off from the sea by a strand of natural concrete containing abundance of *Cerithium vulgatum*, *Conus mediterraneus*, and *Helix Pisana*, etc. The whole of the shells from Alcudia were procured in less than two hours.



One of the land shells from Porto Pi deserves a note specially to itself. It was found adhering to a rock in the full blaze of sunlight,

<sup>1</sup> The old walled Roman town of Alcudia is a mile from the sea; we are dealing with the fishing village.

and looked quite dead when boxed. Six weeks afterwards on being unpacked it was found to have made a fresh epiphragm. It was sent to the Rev. E. H. Bowell, who has, however, not yet reported upon its radula. Its shape and markings are seemingly abnormal, but there are suggestions of *H. aspersa* in its colouring. Its primary whorls most closely resemble a specimen of *Otala vermiculata*, Müll., from the same place, and it may be provisionally placed with that species. It is perhaps, however, a hybrid between *O. vermiculata* and *H. aspersa*. (See figure on p. 119.)

In conclusion I have to thank Dr. Böttger and Messrs. G. K. Gude and A. Santer Kennard for identifications of critical species.

NOTE.—Recent shells, Palma, Mallorca. On March 10th, 1909, returning from the railway station round the walls on the west of Palma, we passed a number of trees (probably plane-trees) with bare patches surrounded by bark. Numerous young snails were in these hollows glued to the trees and varnished over by the exudation of gum from the wounded trees. It was curious to see so many hundreds of young snails thus mummified.

#### PLEISTOCENE.

##### CAP DE PERA.

<i>Vitrea lentiformis</i> (Kob.).	<i>Helicella Nyelli</i> (Pfr.).
<i>Otala Balearica</i> (Zieg.).	<i>Tudorella ferruginea</i> (Lam.).

#### HOLOCENE.

##### MANRESA.

<i>Testacella Maugei</i> , Fér.	<i>Theba Carthusiana</i> (Müll.).
<i>Helicella virgata</i> (Mtg.).	<i>Rumina decollata</i> (Linn.).
<i>H. Itala</i> (Linn.).	<i>Folliculus folliculus</i> (Lam.).
<i>Xerophila caespitum</i> (Drap.), var. aff.	<i>Clausilia bidens</i> , Drap.
<i>introducta</i> , Bgt.	<i>Tudorella ferruginea</i> (Lam.).
<i>Helicomans maritima</i> (Drap.).	
<i>Tachea splendida</i> (Drap.).	
<i>Helix aspersa</i> , Müll.	
<i>Otala vermiculata</i> (Müll.).	
<i>O. lactea</i> (Müll.).	
<i>O. punctata</i> (Müll.).	
<i>Theba Carthusiana</i> (Drap.).	
<i>Rumina decollata</i> (Linn.).	
<i>Cæcilianella acicula</i> (Müll.).	
<i>Pomatias elegans</i> (Müll.).	

##### PORTO PI.

<i>Vitrea</i> sp.
<i>Helicomans maritima</i> (Drap.).
<i>H. variabilis</i> (Drap.).
<i>Helix aspersa</i> , Müll.
<i>H. Pisana</i> , Müll.
<i>H. sp.</i> (young).
<i>Tachea splendida</i> (Drap.).
<i>Leucochroa cariosula</i> (Mich.).
<i>Otala vermiculata</i> (Müll.).
<i>O. lactea</i> (Müll.).
<i>Trochula terrestris</i> (Ch.).
<i>T. elata</i> (Faure-Biguet).

##### MARINE SHELLS

(found mixed with the above).

<i>Columbella rustica</i> , Lam.
<i>Cerithium vulgatum</i> , Brug.
<i>Conus Mediterraneanus</i> , Brug.
<i>Tapes decussatus</i> (Linn.).
<i>Diplodonta lupina</i> (Poli).

##### BELLVER.

<i>Xerocampylea apicina</i> (Lam.).
<i>Trochula terrestris</i> (Ch.).
<i>Rumina decollata</i> (Linn.).
<i>Folliculus folliculus</i> (Lam.).
<i>Clausilia bidens</i> , Drap.

##### ALCUDIA.

<i>Vitrea lentiformis</i> (Kob.).
<i>Helicomans maritima</i> (Drap.).
<i>Trochula elata</i> (Faure-Biguet).

MARINE SHELLS (mixed with the above).

<i>Cerithium vulgatum</i> , Brug.
<i>Osilinus articulatus</i> (Lam.).

	Cap de Pera.	Mauresa.	Orto Pi.	Bellver.	Aleudia.	Manresa.	Pi.	Bellver.	Aleudia.	Manresa.	Pi.	Bellver.	Aleudia.	Christo.	Soller.	Col.
<i>Testacella Maugei</i> , Fér.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vitrea lentiformis</i> (Kob.)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Vitrea</i> sp.	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Helicella conoidea</i> (Drap.)	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	*
<i>H. virgata</i> (Mfg.)	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>H. Arigoï</i> (Rossm.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>H. Itala</i> (Linn.)	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>H. barbara</i> (Linn.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>H. ventricosa</i> (Drap.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Hygromia lanuginosa</i> (Boissy)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Olala Balearica</i> (Zieg.)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>O. vermiculata</i> (Müll.)	.	*	*	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>O. lactea</i> (Müll.)	.	*	*	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>O. punctata</i> (Müll.)	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Xerophila cespitum</i> (Drap.), var. aff. <i>introduc'a</i> , Böttg.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>X. laeta</i> (Lowe)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>Helicomanes variabilis</i> (Drap.)	.	.	*	.	.	.	.	.	.	.	.	.	.	.	.	.
<i>H. maritima</i> (Drap.)	.	*	*	.	*	.	.	.	.	.	.	.	.	*	.	.
<i>Tachea splendida</i> (Drap.)	.	*	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Helix aspersa</i> , Müll.	.	*	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>H. Pisana</i> , Müll.	.	.	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Helix</i> , sp. indet.	.	.	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>H. Molinæ</i> , Hid.	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>H. Nyelli</i> , Pir.	*	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Theba Carthusiana</i> (Drap.)	.	*	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Trochula terrestris</i> (Ch.)	.	.	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>T. elata</i> (Faure-Bignet)	.	.	*	.	.	.	.	.	*	.	.	.	.	*	.	.
<i>Leucochroa cariosula</i> (Mich.)	.	.	*	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Xerocampylea apicina</i> (Lam.)	.	.	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Tudorella ferruginea</i> (Lam.)	*	.	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Rumina decollata</i> (Linn.)	.	*	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Follieulus folliculus</i> (Lam.)	.	.	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Cecilianella acicula</i> , Müll.	.	*	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Clausilia bidens</i> , Drap.	.	*	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Limnea acutatis</i> , Morelet (= <i>auventaria</i> , var. ?)	.	.	*	*	.	.	.	.	.	.	.	.	.	*	.	.
<i>Planorbis umbilicatus</i> , Müll.	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Physa contorta</i> , Michaud	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Pythinia tentaculata</i> (Linn.)	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.	.
<i>Pomatias elegans</i> (Müll.)	.	*	.	.	.	.	.	.	.	.	.	.	.	*	.	.

## RECENT NON-MARINE MOLLUSCA.

## MANRESA.

- Helicella Arigoï* (Rossm.) (dwarf form).  
*Tachea splendida* (Drap.).  
*Pomatias elegans* (Müll.).

## BELLVER.

- Helicella barbara* (Linn.).  
*Otala vermiculata* (Müll.).  
*O. punctata* (Müll.).  
*O. lactea* (Müll.).  
*Trochula terrestris* (Ch.).  
*Helix Pisana*, Müll.  
*H. aspersa*, Müll.  
*Theba Carthusiana* (Müll.).  
*Rumina decollata* (Linn.).  
*Clausilia bidens*, Drap.

## PORTO PI.

- Helicella barbara* (Linn.).  
*Trochula terrestris* (Ch.).  
*Otala vermiculata* (Müll.).  
*Xerocampylæa apicina* (Lam.).  
*Helix*, sp. indet.

## ALCUDIA.

- Helicella virgata* (Da C.).  
*H. ventricosa* (Drap.).  
*H. conoidea* (Drap.).  
*H. Arigoï* (Rossm.).  
*H. barbara*, Linn.  
*Xerophila lauta* (Lowe).  
*Trochula terrestris* (Ch.).

## MARINE SHELLS FROM ALCUDIA, MALLORCA.

- Patella aspera*, Lam.  
*Trochus (Osilinus) articulatus*, Lam.  
*T. (Clanculus) Jussieuï*, Payr.  
*T. (Gibbula) umbilicaris*, L.  
*T. (Calliostoma) elenchoides*, Monts.  
*T. (Gibbula) ardens* (von Salis).  
*T. (Calliostoma) dubius*, Phil.  
*T. (Calliostoma) Kochi*, Polley.  
*T. (Calliostoma) smaragdinus*, Monts.  
*Phasianella pullus* (L.).  
*Natica intricata*, Don, var. *lactea*,  
 Monts.  
*Truncatella truncatula*, Drap. (small  
 var.).  
*Cerithium vulgatum*, Brug.  
*Murex trunculus*, L.  
*Trophon vaginatus*, Cris. & Jan.  
*Rissoa ventricosa*, Desmarest.  
*Nassa costulata*, var. *Renieri*.  
*Conus Mediterraneus*, Brug.  
*Philine aperta* (L.).  
*Dentalium agile*, Sars.  
*Arca Noë*, L.

- Xerocampylæa apicina* (Lam.).  
*Helix Pisana*, Müll.  
*Otala punctata* (Müll.).  
*O. vermiculata* (Müll.).  
*Helix Molinae*, Hid.  
*Rumina decollata* (Linn.).  
*Limnæa acutalis*, Morelet,  
 = *auricularia*, var. (?).  
*Planorbis umbilicatus*, Müll.  
*Physa contorta*, Michaud.  
*Bythinia tentaculata* (Linn.).

## PORTO CHRISTO.

- Helicella ventricosa* (Drap.).  
*H. conoidea* (Drap.).  
*Helix Nyelli*, Pfr.  
*H. Pisana*, Müll.  
*Helicomanes maritima* (Drap.).  
*Trochula terrestris* (Ch.).  
*Tachea splendida* (Drap.).  
*Rumina decollata* (Linn.).  
*Clausilia bidens*, Drap.

## SOLLER.

- Helix Nyelli*, Pfr.

## PASS OVER THE COL, ABOVE SOLLER.

- Hygromia lanuginosa* (Boissy).  
*Helicella virgata* (Müll.).  
*H. Arigoï* (Rossm.).  
*Helix Nyelli*, Pfr.  
*H. Molinae*, Hid.

- Glycimeris stellatus* (Lam.).  
*Pinna nobilis*, L.  
*Ostrea edulis*, var. *Boblayi*, Desh.  
*Spondylus gadaropus*, L.  
*Chama gryphoides* (L.).  
*Pecten varius*, L.  
*P. opercularis*, L.  
*Lima hians* (Gmel.).  
*Lucinopsis undata* (Peun.).  
*Tellina incarnata*, L.  
*Donax venustus*, Poli.  
*D. semistriatus*, Poli.  
*Macra corallina*, var. *stultorum*, L.  
*M. glaucus*, Born.  
*Venus gallina*, L.  
*Tapes aureus* (Gmel.).  
*Cardium glaucum*, Brug. (= *edule*, var.,  
 Röm. & Kob.).  
*C. tuberculatum*, L.  
*C. edule*, L.  
*Cardita sulcata*, Brug.  
*C. calyculata* (L.).  
*Anomia ephippium*, L.